518 Rec'd PCT/PTO 14 SEP 2001

PCT/EP00/02250
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New patent claims

1. Apparatus for determining characteristics of a running material web (11) and/or of a machine for its manufacture and/or refinement, in particular for use in paper making machines, preferably in dryer sections of paper making machines, comprising at least one measuring device (10) which has at least two degrees of freedom of movement respectively corresponding to a rotary movement or a linear movement for the detection at a plurality of measurement locations of data relating to at least one measured parameter and means to detect data about at least one of the following measured parameters:

a) measured parameters which relate to a characteristic value of the air, in particular its temperature or moisture, or an air flow, in particular its direction or speed, in the region of the material web or of the machine; and

b) measured parameters such as the thickness, the temperature or the moisture content of the material web or paper web, the temperature and/or the dew point of the dry air used to dry the material web, the temperature prevailing at or in the region of the surface of the dryer cylinder of a paper making machine, the permeability at dryer sieves, the speed of air flows present in particular at the surface of dryer sieves or the air humidity at

the individual machine components or at certain locations of the material web.

2. Apparatus in accordance with claim 1, characterised in that the measuring device (10) is movable during the measurement and in particular without interruption of the data detection.

3. Apparatus in accordance with claim 1 or claim 2, characterised in that the measuring device (10) is simultaneously able to carry out a plurality of movements each corresponding to one degree of freedom.

4. Apparatus in accordance with at least one of the preceding claims, characterised in that movements of the measuring device (10) each corresponding to a degree of freedom can be carried out one after the other timewise.

5. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is movable along two longitudinal axes (x, y, z) preferably extending perpendicular to one another.

6. Apparatus in accordance with at least one of the claims 1 to 4, characterised in that the measuring device (10) is movable along three longitudinal axes (x, y, z) which preferably respectively extend pair-wise perpendicular to one another.

7. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is movable in the longitudinal direction of the material web (11) perpendicular to the direction of movement of the web and/or vertically.

8. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is movable by the execution of a plurality of linear movements, preferably two or three linear movements respectively extending pair-wise perpendicular to one another, along a curve in space which can be preset as desired.

9. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is rotatable about two axes (x, y, z) which preferably extend perpendicular to one another.

10. Apparatus in accordance with at least one of the claims 1 to 8, characterised in that the measuring device (10) is rotatable about three axes (x', y', z') which preferably respectively extend pair-wise perpendicular to one another.

11. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) can be oriented in any desired manner in space by executing a plurality of rotary movements, preferably two or three rotary movements about axes (x', y', z') which extend perpendicular to one another.

12. Apparatus in accordance with at least one of the preceding claims,

characterised in that the measuring device (10) can be moved along any desired presettable curve in space and can be oriented in any desired manner in space by executing a plurality of linear movements and rotary movements which take place simultaneously and/or after one another timewise.

13. Apparatus in accordance with at least one of the preceding claims, characterised in that the orientation of at least one longitudinal axis (x, y, z) of the measuring device (10) in space can be changed.

14. Apparatus in accordance with at least one of the preceding claims, characterised in that the orientation of at least one rotational axis (x', y', z') of the measuring device (10) can be changed in space.

15. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is movable relative to a stationary frame or beam.

16. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is attached, in particular movably attached, to a frame (12) or beam (19, 22, 28, 36) movable relative to a machine.

17. Apparatus in accordance with at least one of the claims 1 to 14, characterised in that the measuring device (10) is movably attached to the machine.

18. Apparatus in accordance with at least one of the claims 1 to 14, characterised in that it is provided in the form of a mobile unit which can be used at different positions of a machine.

19. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is movable via a joint (14), in particular a ball joint, which enables a pivotal movement in at least one plane.

20. Apparatus in accordance with at least one of the preceding claims, characterised in that at least one measurement location is provided compatible with a plurality of different measuring devices (10), in particular measuring devices provided in the form of exchangeable measuring heads.

21. Apparatus in accordance with at least one of the preceding claims, characterised in that a plurality of measuring devices (10), in particular provided in the form of interchangeable measuring heads, can be combined into one unit.

22. Apparatus in accordance with at least one of the preceding claims, characterised in that at least one measurement location compatible with different measuring devices (10) and/or a plurality of measuring devices (10), which are in particular interchangeable, are provided for the detection of data relating to different measured parameters.

23. Apparatus in accordance with at least one of the preceding claims, characterised in that at least one common operating unit, in particular a control unit, drive unit, supply unit, data detection unit and/or evaluation unit, is associated with the measuring devices (10).

24. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is attached to a frame (12) which preferably extends transverse to the web running direction beneath the machine or over the machine, in particular in the region of a dryer cylinder (16) and/or a dryer roll (42) of a paper making machine which is preferably supported on both sides of the machine.

25. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is attached to a beam (13) which preferably projects in the vertical direction or transverse to the web running direction into the machine, in particular into the dryer section of a paper making machine.

26. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is movable beneath the machine, in particular in the cellar of a dryer section of a paper making machine.

27. Apparatus in accordance with at least one of the preceding claims,

characterised in that a protective device is provided which protects the measuring device (10), in particular from downwardly falling articles, and which is preferably formed by a scraper (44) and/or a sheet metal shield (46).

28. Apparatus in accordance with at least one of the preceding claims, characterised in that an electrical, pneumatic and/or hydraulic drive is provided for the measuring device (10).

29. Apparatus in accordance with at least one of the preceding claims, characterised in that the measuring device (10) is manually movable.

30. Apparatus in accordance with the preamble of claim 1, characterised in that the measuring device (10) is rotatable about an axis for the detection of data relating to at least one measured parameter at a plurality of measurement locations.

31. Apparatus for determining characteristics of a running material web (11) and/or of a machine for its manufacture and/or refinement, in particular for use in paper making machines, preferably in dryer sections of paper making machines, in particular in accordance with any one of the preceding claims, comprising at least one measuring device (10) which has at least two degrees of freedom of movement respectively corresponding to a rotary movement or a linear movement for the detection at a plurality of measurement locations of data relating to at least one measured parameter and is guided such that it is movable along

two longitudinal axes (x, y, z), which preferably extend perpendicular to one another, with it preferably being movable in the longitudinal direction of the material web (11) perpendicular to the direction of movement of the web and/or vertically

32. Method for determining characteristics of a running material web (11) and/or of a machine for its manufacture and/or refinement, in particular for use in paper making machines, preferably in dryer sections of paper making machines, by means of at least one measuring device (10), in particular in accordance with any one of the preceding claims, which has at least two degrees of freedom of movement respectively corresponding to a rotary movement or a linear movement for the detection at a plurality of measurement locations of data relating to at least one measured parameter, in which by means of the measuring device (10) data about at least one of the following measured parameters are detected:

a) measured parameters which relate to a characteristic value of the air, in particular its temperature or moisture, or an air flow, in particular its direction or speed, in the region of the material web or of the machine; and

b) measured parameters such as the thickness, the temperature or the moisture content of the material web or paper web, the temperature and/or the dew point of the dry air used to dry the material web, the temperature prevailing at or in the region of the surface of the dryer cylinder of a paper making machine, the permeability at dryer sieves, the speed of air flows present in particular at the surface of dryer sieves or the air humidity at the

particular at the surface of dryer sieves or the air humidity at the individual machine components or at certain locations of the material web.

EP 0 000 002 250 B2